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TMX 424
Multiplexer for Connection of Teletypewriters on-line to RC4000

General Information

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SHORT DESCRIPTION

The TMX 424 is designed to connect from 1 to 24 teletypewriter terminals to the low speed channel of the RC4000 system.

The teletypewriters may be of the 7-channel type (acc. to CCITT alphabet) or the 11-element type (acc. to CCITT 5 alphabet). The terminals are interfaced according to CCITT/ISO recommendations and may be connected directly, via private lines or via the switched telegraph or telephone networks. The multiplexer accepts terminals operating at 50-100-110 and 200 baud. The modem must apply to the CCITT recommendation V24.

OPERATIONAL DESCRIPTION 2

General 2.1

The teletypewriter may be used in OFF-line status or ON-line status. In OFF-line status the teletypewriter may be operated without interfering with RC4000. In ON-line status RC4000 controls the communication with the terminal. A full duplex connection is possible and should be preferred.
The terminals are connected to the RC4000 low speed data channel via a controller/multiplexer, which will serve a maximum of 24 terminals. It consists of one character register with associated control circuits per terminal to control transmission and reception of characters. Associated with these are the two Interrupt registers of max. 24 bits, which store the interrupts from input/output operations and operator interrupts respectively. Each of these operations is terminated by sending one of the interrupt signals to RC4000. The contents of the corresponding interrupt register is then sensed by a Sense Command to find the number of the terminals causing the interrupt. The interrupt register is cleared by the Sense Command.

Addressing 2.2

All terminals on a multiplexer have addresses in sequence. Calling the base address B the terminals are addressed as follows:

B:	Interruptregister for input/output operations
B+1:	Interruptregister for operator interrupts
B+2 to B+25:	Terminals

B and B+1 respond to a Sense Command only.

Sense Command 2.3

The terminals respond to two modifications of the Sense Command.

Modification 0: Transfer Data, Transmission Error Status and Time Out Status.
Modification 1: Transfer the Terminalcategory as
- Category 0: 8-bit ISO-Code
- \- 1: 5-bit CCITT2-Code.

If avaiable, i.e. not transmitting or receiving, the terminals respond to Read, Write and two modifications of Sense Command.

The data character transferred to the working register depends upon the type of terminal an which command caused the latest interrupt, as indicated below

pos.	17	18	19	20	21	22	23
Write Command	0	0	0	0	0	0	0
Read Comm. 8-bit code	b7	b6	b5	b4	b3	b2	b1
Read Comm. 5-bit code	0	0	b5	b4	b3	b2	b1

Status Bits:

Transmission Error: After Read operations this bit will indicate an odd Parity for 8 bit characters.

Time Out: Indicates that a Write or Read Operation has been terminated because it could not be completed within 2 to 4 seconds.

Read Command 2.4

The Read Command clears the status bits, and enables the bufferregister to receive one character. A Read operation is terminated by:

Stopelement of Character Sensed or by Time Out

Upon termination an interrupt is sent to RC4000. In order to be sure to receive the next character from the terminal RC4000 should respond with a Sense Command and a new Read command in less than 15 mS (100 baud, 11-element) or 20 mS (50 baud, 7-element).

For terminals where a separation between keyboard and printer is possible, the received character is retransmitted with a delay of one half element duration if a full duplex connection is provided. The retransmitted signal controls the printer, so that at least two errors must occur to leave a difference between keyboard character and printed character undetectable to the operator.

The retransmission will only take place when a Read Operation has been set up before the startelement of the next character is received.
If the startelement of a character is received at a time when no Read operation has been set up a synchronization circuit is activated with the purpose of blocking the reception. (Reception of a character may only begin in a startelement). The reception of characters will remain blocked until a stopelement of duration min. 167 mS - max. 335 mS has been received, i.e. the operator has stopped his input for a moment.

Operator Interrupt 2.5

If no Read operation is set up in the situation described above, a counting circuit is enabled to count the numbers of 0 to 1 transitions in the characters received from the terminal. The counting is disabled if a Read operation is set up.
When the count reaches 12 the counting is stopped. When a stopelement of duration as indicated above is sensed thereafter the counter is again reset to 0. The transition from counter state 12 to state 0 generates an interrupt to RC4000. It is thus possible to generate an interrupt by transmitting a number of characters from the terminal at a time when no Read operation has been set up, f.ex. by depressing a repeating key for the duration of say 1 second.

Write Command 2.6

The Write Command clears the status bits and transfers one character from the working register to the bufferregister and initiates transmission. The transmission is terminated upon sensing the stopelement of the transmitted character or by time out, and an interrupt is sent to RC4000. In order to continue transmission at maximum speed RC4000 should respond with a new Write Command in less than 20 mS (100 baud 11-element) or 30 mS (50 baud 7-element). The time from Write Command to interrupt is at most 150 mS.

ON-line/OFF-line Switch 2.7

When the modem of the transmission medium indicates some status of no connection the terminal is regarded disconnected. This may be due to transmission failure or due to the terminal being in OFF-line status.

OPERATION 3

Since the terminals used on the TMX 424 are standard teletype-writers the manufacturers original operation instruction is still valid.
However the use of the unit as a communication terminal introduces the following additions.

ON-line/OFF-line Button and Lamp. 3.1

In order to connect the terminal online to RC4000 the operator must press the ON-line/OFF-line button. When established, the ON-line connection will be indicated by the ON-line lamp.
When ON-line, the terminal can be disconnected by activating the same button. When disconnected the terminal is available for OFF-line use.

Operator Interrupts 3.2

If the operator wants to send an interrupt during a non input situation, he must press the automatic answer back button.

SIGNAL SPECIFICATION

The interface between the telemultiplexer, and the 24 terminals fulfils the CCITT recommendation V24.

The circuits actually used are:

No. 1
- 2
- 3
- 4
- 5
- 6
- 7
- 9

These circuits are necessary to control the modems performing the transmission over telephone lines. However, they also allow the multiplexer and the terminals to be directly connected via cables.